ABSTRACT OF THE DISCLOSURE

A low noise multi-loop radio frequency synthesizer receives an input reference signal having a frequency f_R, into a fine tune PLL and a coarse tune PLL. The fine tune PLL outputs a fine tune signal with frequency $f_R \square P$, P beings an integer, while the coarse tune PLL outputs a coarse tune signal with frequency $f_R \square A$, where A is an integer. A translation PLL has a unity multiplication factor and is driven by the fine tune signal output. The frequency synthesizer has a Gilbert cell double balanced mixer coupled between the coarse tune and the translation PLLs, the Gilbert cell mixer combining the coarse tune signal and the output signal of the translation PLL and coupling the mixed signal into the translation PLL. The translation loop outputs a signal with a frequency proportional to the linear sum of the coarse tune signal and the fine tune signal.